Message

**From:** Hays, David C Jr CIV USARMY CENWK (USA) [David.C.Hays@usace.army.mil]
**Sent:** 1/29/2021 2:51:31 PM
**To:** Praskins, Wayne [Praskins.Wayne@epa.gov]
**Subject:** RE: HPNS: Navy swipe sample results

Wayne, you are correct. The equilibrium assumed would just be applied to each isotope. So if assume 0.9 then 1+(4*0.9) = 4.6. Pb-210 is one daughter with a long half live so some people handle it differently. But, that should again match what was assumed in the BPRG or RESRADBLD model. Most literature uses a 40% equilibrium assumption but can be anything 0-1. How we regulate Rn in the US is complicated at best (federal agencies have guidance limits assuming differing equilibrium thus different limits).

I do not know of a site where we have used different equilibrium we typically assume 100% or 0 as agreed to with regulator.

I would have to look back at my notes but think I was able to get a higher BPRG with use of a few site specific parameters. I believe I emailed that table to you at some point. Even a slight increase in BPRG times the daughters will help the MDC issue. I will look into this more next week.

Hope this helps. Enjoy your weekend.
Dave

**From:** Praskins, Wayne <Praskins.Wayne@epa.gov>
**Sent:** Thursday, January 28, 2021 5:57 PM
**To:** Hays, David C Jr CIV USARMY CENWK (USA) <David.C.Hays@usace.army.mil>
**Subject:** [Non-DoD Source] RE: HPNS: Navy swipe sample results

Dave –

I'm thinking about your idea of accounting for alpha-emitting progeny when comparing gross alpha measurements to BPRGs. Does the following capture (and extend) our discussion?

- I'm pretty sure that the BPRGs for the alpha emitting HPNS radionuclides assume secular equilibrium of all progeny (and no radon loss). (Looked at user's guide and talked with Stuart.) If this assumption is maintained, as you explain in your email, a 20 dpm gross alpha measurement would represent 4 dpm Ra-226
- Similarly, a 20 dpm gross alpha measurement would represent about 3 dpm Th-232 (5 alpha emitting progeny), U-235 (6 progeny), and Pu-239 (7 progeny)
- No such adjustment for Am-241 since it has no alpha emitting progeny
- Conversely, the MDA required to achieve the BPRGs would be:

| | A | B | |
|---|---|---|---|
| | BPRG (dpm/100cm2) | Parent + Alpha-emitting progeny | Gross alpha MDA to achieve BPRG, assuming 100% equilibrium btwn Rn and progeny |
| Am-241 | 4.4 | 1 + 0 | 4.4 |
| Pu-239 | 4.1 | 1 + 7 | 33 |
| Ra-226 | 1.2 | 1 + 4 | 6 |
| Th-232 | 2.4 | 1 + 5 | 14 |
| U-235 | 4.7 | 1 + 6 | 33 |

- So, if 100% equilibrium is assumed, and Am-241 could be present, you would want the gross alpha MDA to be at or less than 4.4?
- At most of the Hunters Point buildings, Am-241 is not listed as a radionuclide of concern. We would need to decide if it's appropriate to assume that radionuclides not identified as radionuclides of concern are not present.
- If 50% equilibrium were assumed between radon and its progeny, how would you calculate the MDA? For Ra-226, would you multiply by 3, to reflect the parent and four progeny at half the parent's activity (1 + 4 * ½ = 3)?
- Do you know of site examples where an equilibrium value less than 100% has been used? Would the value vary between radionuclides, depending on the radon isotope in the decay chain? In their HPNS RESRAD BUILD simulations, the Navy assumed 10% loss (i.e., progeny remain at 90% of the radon parent concentration).

Wayne Praskins | Superfund Project Manager
**U.S. Environmental Protection Agency Region 9**
75 Hawthorne St. (SFD-7-3)
San Francisco, CA 94105
415-972-3181

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**From:** Hays, David C Jr CIV USARMY CENWK (USA) <David.C.Hays@usace.army.mil>
**Sent:** Wednesday, January 27, 2021 6:36 AM
**To:** Praskins, Wayne <Praskins.Wayne@epa.gov>
**Subject:** RE: HPNS: Navy swipe sample results

Wayne, yes. I may be driving all day today but regardless could take a call. I can make time on other days. When would be best for you this week? I concur with their statements of uncertainty with wipe testing.

FYI: The attached goes into deep detail about wipe sampling, and is likely too much info but FYI. Supports Navy declarations. Note: It fails to describe or present a path to converting gross counting activity to isotopic specific activity but please see below.

FYI: I looked at the attachments, data looks good for a 1 minute count. Note for estimating purposes; doubling the count time typically reduces the MDC by a factor of 1.4142 (i.e. the square root of 2). So a 2 min count should reduce alpha MDC to 11 dpm. I do think the Navy should also consider the specific isotope limit versus the non isotope specific counting approach. E.g. A gross alpha result of 20 dpm would need to be corrected to the specific isotope activity (Ra-226). Thus given the number of alpha decays assumed for the Ra-226 decay chain (accounting for Rn daughter equilibrium) the Ra-226 activity represented by a net gross alpha count of 20 dpm may be 20 dpm Ra-226 (assumes no equilibrium) to 4 dpm Ra-226 (assumes full equilibrium). Likely value is somewhere in between but they would have to defend their assumptions on that. This approach could be applied to estimating the Ra-226 MDC as well, but again Navy would need to make assumptions and defend them.